

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Y. Yamada et al. : Art Unit:
Serial No.: 10/017,364 : Examiner:
Filed: December 12, 2001 :
**APPARATUS FOR
ELECTRIC DISCHARGE
MICROMACHINING**

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, DC 20231

SIR:

Prior to examination, please amend the above-identified application as follows:

DRAWINGS:

Subject to approval by the Examiner in charge of the above-identified application, please add the legend "PRIOR ART" to Figure 8 as indicated in red on the marked-up copy of Figure 8 attached herewith.

CLAIMS:

Please cancel claims 1-26.

Please add the following new claims 27-52:

- 1 27. (Newly Added) An elecro discharge machining apparatus,
2 comprising:
 - 3 a first holder for holding a workpiece;
 - 4 a tool electrode arranged opposite to the workpiece;

5 a capacitor charged by a power source device through a resistor;

6 a current detecting element for detecting a short circuit;

7 a switching element intervening a discharge circuit between the
8 capacitor, and at least one of the tool electrode, the workpiece and the power
9 source;

10 a control unit for controlling switching timing in accordance with a
11 result of detecting a short circuit,

12 wherein a short circuit detection signal is input, the switching
13 element is turned off and, after predetermined time, the switching element is
14 turned on.

1 28. (Newly Added) An electro discharge machining apparatus
2 according to claim 27, further comprising:

3 a drive control unit for controlling movement of the tool electrode,

4 5 wherein the short circuit detection signal is input, the tool electrode
is moved to increase a gap between the tool electrode and the workpiece.

1 29. (Newly Added) An electro discharge machining apparatus
2 according to claim 27, further comprising:

3 a motor for rotating the tool electrode; and

4 a second holder for holding the motor and the tool electrode,

5 6 wherein the second holder is made of a low thermal expansive
substance.

1 30. (Newly Added) An electro discharge machining apparatus
2 according to claim 29, wherein the coefficient of thermal expansion of the low
3 thermal expansive substance is 5×10^{-6} or less.

1 31. (Newly Added) An electro discharge machining apparatus
2 according to claim 29, wherein the low thermal expansive substance is an invar
3 alloy.

1 32. (Newly Added) An electro discharge machining apparatus
2 according to claim 27, further comprising:

3 a motor for rotating the tool electrode; and

4 a second holder for holding the motor and the tool electrode,

5 wherein an thermal isolator is equipped between the motor and the
6 second holder.

1 33. (Newly Added) An electro discharge machining apparatus
2 according to claim 27, further comprising:

3 a motor for rotating the tool electrode; and

4 a second holder for holding the tool electrode,

5 wherein space is set between the motor and the second holder.

1 34. (Newly Added) An electro discharge machining apparatus ,
2 comprising:

3 a first holder for holding a workpiece;

4 a tool electrode arranged opposite to the workpiece;

5 a capacitor charged by a power source device through a resistor;

6 and

7 a switching element intervening a discharge circuit between the
8 capacitor, and at least one of the tool electrode, the workpiece and the power
9 source; and

10 a switch controller for controlling on and off of the switching
11 element,

12 wherein the switching element alternatively is turned on and off so
13 that duration of the pulse electro discharge is less than or equal to a
14 predetermined time.

1 35. (Newly Added) An electro discharge machining apparatus
2 according to claim 34, wherein the predetermined time is a time from the
3 beginning of the pulse electro discharge to the onset of electrolysis in one of the
4 tool electrode and the workpiece.

1 36. (Newly Added) An electro discharge machining apparatus
2 according to claim 34, further comprising:

3 a motor for rotating the tool electrode; and
4 a second holder for holding the motor and the tool electrode,
5 wherein the second holder is made of a low thermal expansive
6 substance.

1 37. (Newly Added) An electro discharge machining apparatus
2 according to claim 36, wherein the coefficient of thermal expansion of the low
3 thermal expansive substance is 5×10^{-6} or less.

1 38. (Newly Added) An electro discharge machining apparatus
2 according to claim 36, wherein the low thermal expansive substance is an invar
3 alloy.

1 39. (Newly Added) An electro discharge machining apparatus
2 according to claim 34, further comprising:

3 a motor for rotating the tool electrode; and
4 a second holder for holding the motor and the tool electrode,

5 wherein an thermal isolator is equipped between the motor and the
6 second holder.

1 40. (Newly Added) An electro discharge machining apparatus
2 according to claim 34, further comprising:

3 a motor for rotating the tool electrode; and
4 a second holder for holding the tool electrode,

5 wherein space is set between the motor and the second holder.

1 41. (Newly Added) An electro discharge machining apparatus,
2 comprising:

3 a first holder for holding a workpiece;
4 a tool electrode arranged opposite to the workpiece;
5 a capacitor charged by a power source device through a resistor;
6 a current detecting element for detecting a current between the tool
7 electrode and the workpiece;

8 a control unit for, based on the current detected by the current
9 detecting element, judging whether or not a period of pulse electro discharge is
10 less than or equal to a predetermined period; and

11 an adjuster for, when it is judged that the period of the pulse
12 electro discharge is less than or equal to the predetermined period, adjusting an
13 electric resistance value between the power source and the capacitor so that the
14 period of the pulse electro discharge is greater than the predetermined period.

1 42. (Newly Added) An electro discharge machining apparatus
2 according to claim 41, further comprising:

3 a motor for rotating the tool electrode; and

4 a second holder for holding the motor and the tool electrode,
5 wherein the second holder is made of a low thermal expansive
6 substance.

1 43. (Newly Added) An electro discharge machining apparatus
2 according to claim 42, wherein the coefficient of thermal expansion of the low
3 thermal expansive substance is 5×10^{-6} or less.

1 44. (Newly Added) An electro discharge machining apparatus
2 according to claim 42, wherein the low thermal expansive substance is an invar
3 alloy.

1 45. (Newly Added) An electro discharge machining apparatus
2 according to claim 41, further comprising:

3 a motor for rotating the tool electrode; and
4 a second holder for holding the motor and the tool electrode,
5 wherein an thermal isolator is equipped between the motor and the
6 second holder.

1 46. (Newly Added) An electro discharge machining apparatus
2 according to claim 41, further comprising:

3 a motor for rotating the tool electrode; and
4 a second holder for holding the tool electrode,
5 wherein space is set between the motor and the second holder.

1 47. (Newly Added) An electro discharge machining apparatus,
2 comprising:

3 a first holder for holding a workpiece;
4 a tool electrode arranged opposite to the work piece;

5 a capacitor charge by a power source device through a resistor;
6 a current detecting element for detecting a short circuit;
7 a control unit for, based on the current detected by the current
8 detecting element, judging whether or not a short circuit has occurred for a
9 predetermined time between the workpiece and the tool electrode; and
10 an adjuster for, when it is judged that a short circuit has occurred
11 for the predetermined time between the workpiece and the tool electrode,
12 adjusting an electric resistance value between the power source and the capacitor
13 so that a period of the pulse electro discharge is elongated.

1 48. (Newly Added) An electro discharge machining apparatus
2 according to claim 47, further comprising:

3 a motor for rotating the tool electrode; and
4 a second holder for holding the motor and the tool electrode,
5 wherein the second holder is made of a low thermal expansive
6 substance.

1 49. (Newly Added) An electro discharge machining apparatus
2 according to claim 48, wherein the coefficient of thermal expansion of the low
3 thermal expansive substance is 5×10^{-6} or less.

1 50. (Newly Added) An electro discharge machining apparatus
2 according to claim 48, wherein the low thermal expansive substance is an invar
3 alloy.

1 51. (Newly Added) An electro discharge machining apparatus
2 according to claim 47, further comprising:

3 a motor for rotating the tool electrode; and
4 a second holder for holding the motor and the tool electrode,

5 wherein an thermal isolator is equipped between the motor and the
6 second holder.

1 52. (Newly Added) An electro discharge machining apparatus
2 according to claim 47, further comprising:

3 a motor for rotating the tool electrode; and
4 a second holder for holding the tool electrode,

5 wherein space is set between the motor and the second holder.

Respectfully Submitted,


Andrew L. Ney
Andrew L Ney, Reg. No. 20,300
Attorney for Applicants

ALN/ap

Dated: April 9, 2002
P.O. Box 980
Valley Forge, PA 19482-0980
(610) 407-0700

The Assistant Commissioner for Patents
is hereby authorized to charge payment
to Deposit Account No. 18-0350 of any
fees associated with this communication.

I hereby certify that this correspondence is being
deposited with the United States Postal Service with
sufficient postage as first class mail in an envelope
addressed to: Assistant Commissioner for Patents,
Washington, D.C. 20231 on:


4/9/02


A. Kinto

VERSION WITH MARKINGS TO SHOW CHANGES MADE

CLAIMS:

Claims 1-26 are cancelled.

Claims 27-52 have been added.

FIG. 8
PRIOR ART

